University of Calabria

Department of Mathematics and Computer Science

Master Thesis in Computer Science

Multiclass Classification of Biosignals using several Supervised Learnign approaches

In collaboration with

Faculty of Sciences of the
University of Lisbon

IT-Institute of
Technology of Lisbon

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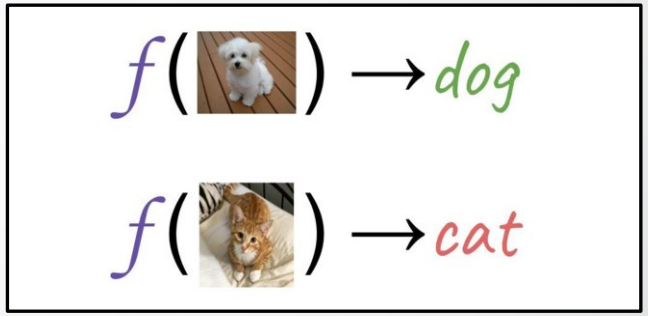
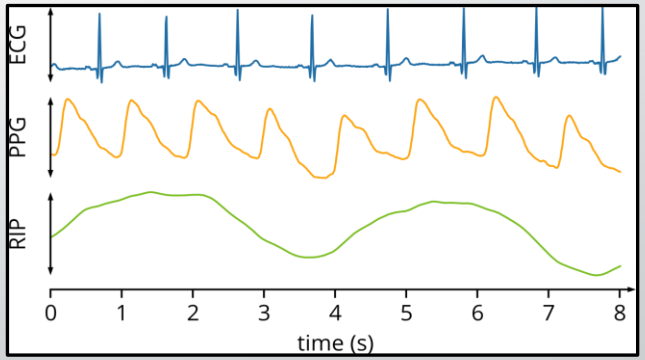
Context

- Classification problem



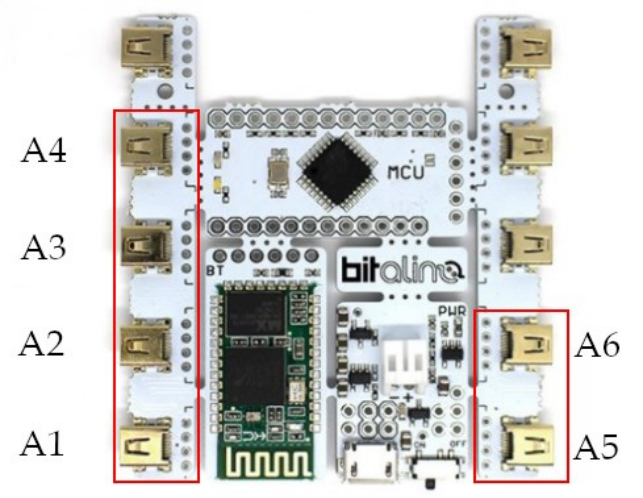
- Biosignals

(ECG, EMG, EDA,…)



Problem

- Problem faced by IT with its project BITalino



Users must tell the program which sensor they have plugged-in in which port!

Leads to

Unlabeled data

Objective of the work

Automatize classification of biosignals with **Machine Learning**

Workflow

WESAD

Preprocessing steps
(Common to all approaches)

fork

1st Approach

Statistical Feature Extraction
(Mean, Std dev., Kurtosis, Skewness)

Create Feature and Label Vectors

SVM

KNN

RF

DNN

2nd Approach

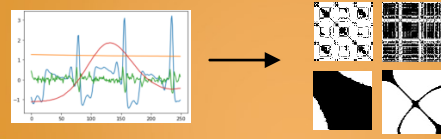
Create Feature and Label Vectors

W-DNN

1D-CNN

3rd Approach

Recurrence Plots generation



Create Feature and Label Vectors

2D-CNN

Conclusions

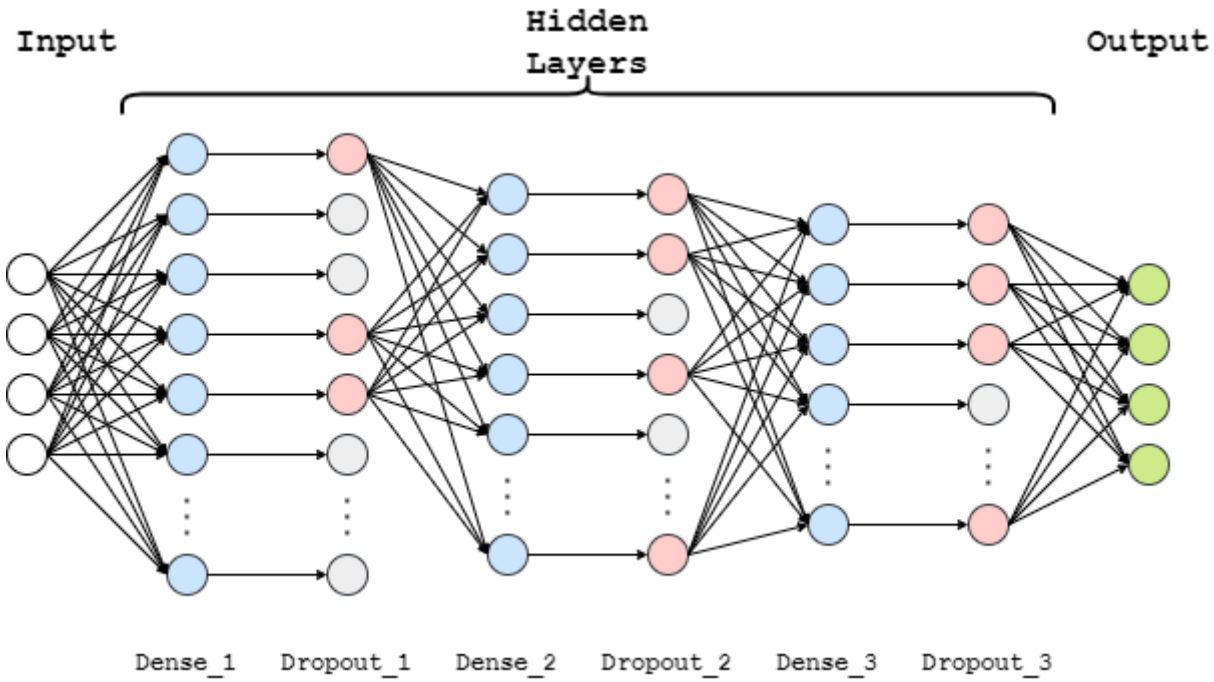
Very promising results!

Better than the one achieved by the BITalino's Team in recent paper (96,7%)

Approach	Model	Accuracy
1st	**SVM**	95,84%
1st	**KNN**	97,66%
1st	**RF**	98,74%
1st	**DNN**	99,15%
2nd	**W-DNN**	98,80%
2nd	**1D-CNN**	**99,74%**
3rd	**2D-CNN**	99,62%

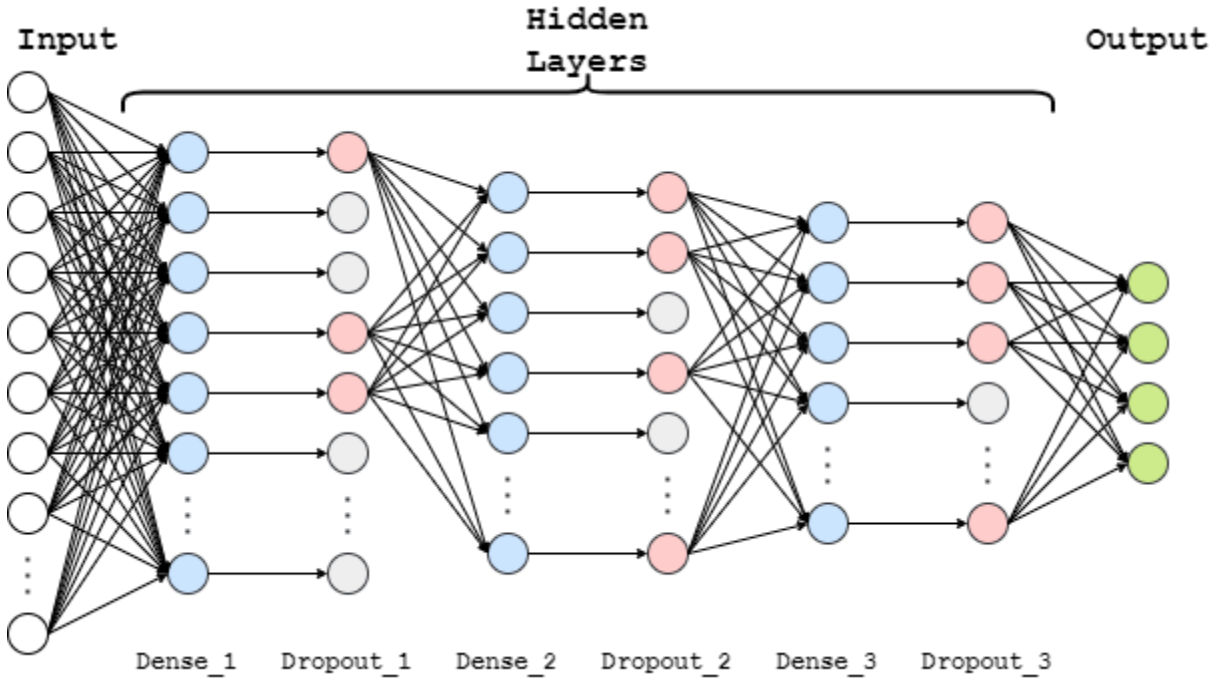
Showing a tendency of Neural Network models to outperform classical ones

Thanks for your attention!



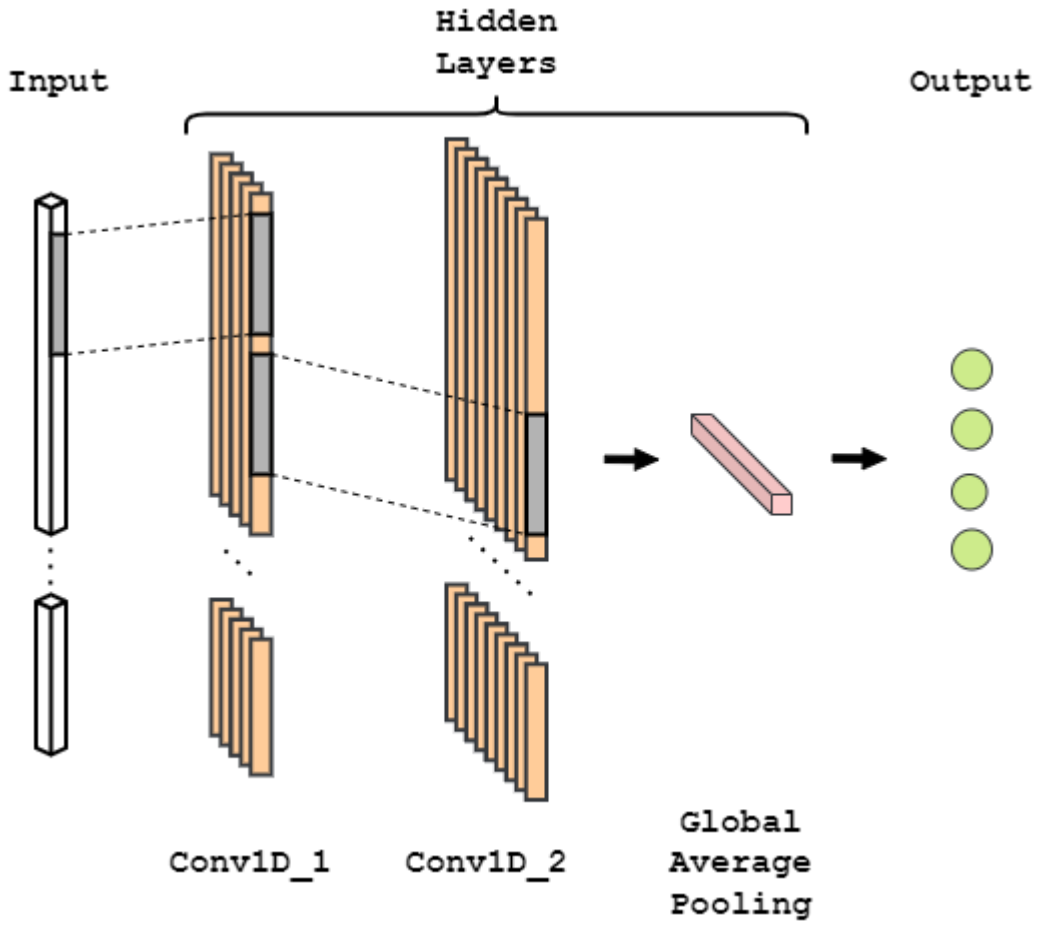
DNN

(1st approach)



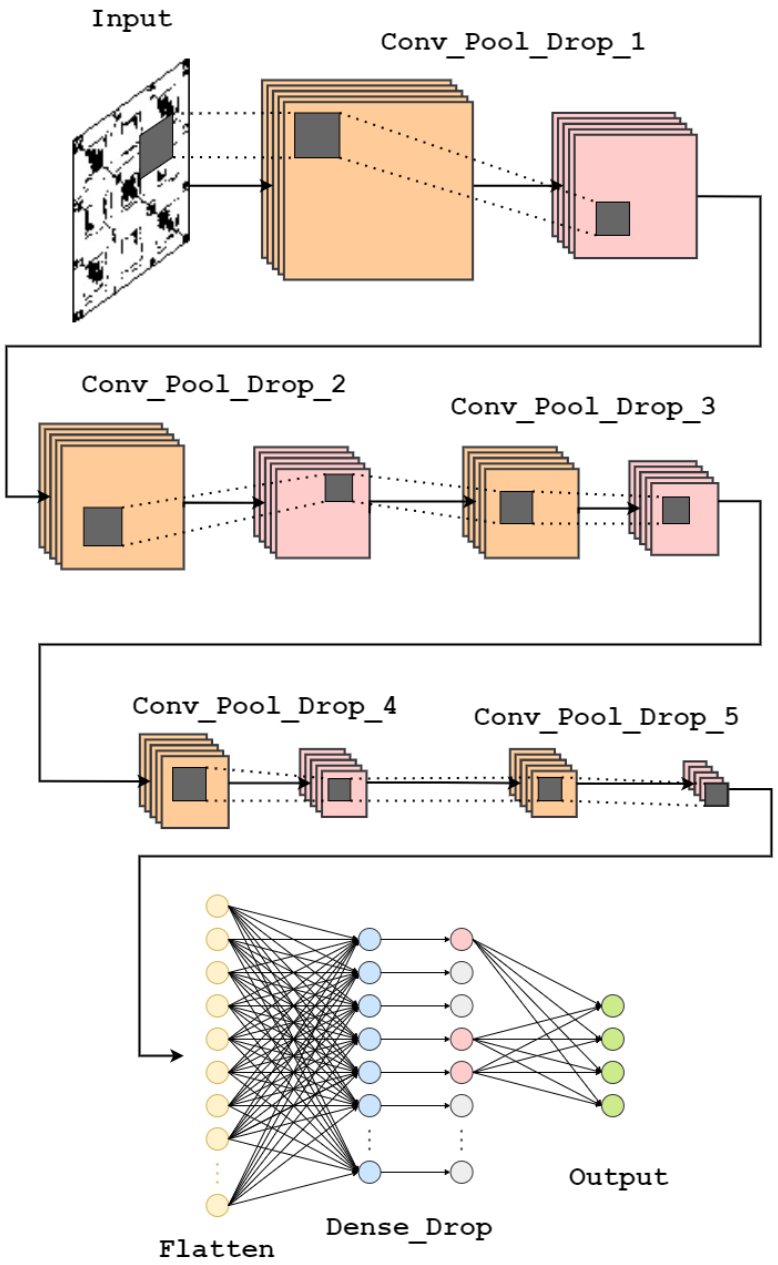
W-DNN

(2nd approach)



1D-CNN

(2nd approach)



2D-CNN

(3rd approach)